

Claims

1. In a process for biological treatment of a suspension in a bioreactor that has a central outlet area near the bottom and in which to circulate the suspension, at least some of the suspension is routed through a vertically aligned guide zone so that a vertical flow of at least a portion of the suspension is produced, which flow extends into the vicinity of the bottom of the bioreactor or proceeds from the vicinity of the bottom of the bioreactor, the improvement comprising feeding at least one horizontal jet of fluid superimposing on the vertical flow in the bottom part of the bioreactor, so as to establish a spiral flow to the central outlet area of the bioreactor.

2. A process according to claim 1, wherein the jet of fluid is fed into the bioreactor with a flow velocity of from 10 to 15 m/s.

3. A process according to claim 1, wherein the jet of fluid is fed into the bioreactor with a volumetric flow rate of from 300 to 600 m³/h.

4. A process according to claim 1, wherein in the bottom part of the bioreactor on the bioreactor wall, of the spiral flow has a flow-velocity of 0.5 m/s.

5. A process according to one of claims 1 to 4, wherein the jet of fluid is fed into the bioreactor at an offset angle to radial flow of from 40 to 50°.

6. A process according to claim 1, wherein the fluid is fed into the bioreactor at an angle from 0 to 10° to the horizontal, tilted down.

7. A process according to claim 1, comprising withdrawing the suspension from the bioreactor recycling said suspension into the bioreactor via a nozzle.

8. A process according to claim 1, wherein the jet of fluid is fed into the bioreactor via several nozzles that are distributed on the periphery of the bioreactor in the vicinity of the bottom.

9. A process according to claim 8, wherein the nozzles are supplied with a jet fluid, at different times.

10. A process according to claim 8, wherein the nozzles are operated with a common pump and are successively supplied from the latter by means of cyclic switching of the series.

11. A process according to one of claims 7 to 10, wherein the suspension is suctioned off from the center of the bottom of the bioreactor.

12. A process according to one of claims 7 to 11, wherein the fluid that is suctioned off from the bioreactor is fed into the bioreactor in part or in a time sequence in addition via at least one nozzle provided in the area of the suspension fill level such that the surface of the suspension and/or the top scum floating on the surface of the suspension is forced into rotary flow.

13. A process according to claim 12, wherein the jet of fluid is fed into the fermentation reactor via nozzles that are located tangentially on the periphery of the tank.

14. A process according to claim 13, wherein the nozzles are supplied from the same pump as the nozzles located in the vicinity of the bottom.

15. Device for biological treatment of a suspension with a bioreactor for receiving the suspension, in the interior of the bioreactor there being a guide means that extends into the vicinity of the bottom of the bioreactor with a vertical alignment for circulating

the suspension, wherein there is at least one nozzle for feeding a fluid into the bioreactor in the vicinity of the bottom of the bioreactor.

16. Device according to claim 15, wherein the nozzle can be supplied with the suspension via a feed line that is connected to the interior of the bioreactor and via a pump.

17. Device according to claim 15 or 16, wherein there are several nozzles distributed in the vicinity of the bottom on the periphery of the bioreactor.

18. Device according to claim 17, wherein the nozzles are connected to a common pump.

19. Device according to claim 17 or 18, wherein the nozzles are arranged with a tilt angle against the horizontal between 0 and 10°.

20. Device according to one of claims 16 to 19, wherein the bioreactor bottom has an incline from the edge of the tank to the middle of preferably 10 to 20°.

21. Device according to one of claims 16 to 20, wherein the feed line connected to the interior of the bioreactor is additionally connected to at least one nozzle that is located in the area of the intended suspension fill level.

22. Device according to claim 21, wherein the nozzle is located tangentially on the periphery of the tank.

23. Device according to claim 21 or 22, wherein the nozzle is connected to the same pump as the nozzle that is located in the vicinity of the bottom of the bioreactor.